orders cannot be accounted for by assuming that the atoms in the salt crystal are made up of single rings of electrons, or by assuming a uniform volume distribution of the electrons in spheres. A distribution which fits Bragg's data acceptably is an arrangement of the electrons in equally-spaced, concentric rings, each ring having the same number of electrons, and the diameter of the outer ring being about 0·7 of the distance between the successive planes of atoms.

If, as D. L. Webster assumes (*Phys. Rev.*, vol. v., p. 238, 1915) the trains of waves of the primary beam of X-rays are short compared with the distance which the rays penetrate the crystal, certain corrections have to be applied to the experimental data, and on this assumption it can be shown that the average distance of the electrons from the centre of the atom is small compared with the distance between the atoms.

Experiments are now in progress to test the validity of Webster's assumption and to determine more accurately the rate of variation of the intensity of the reflected beam with the order. It is hoped that it will be possible in this manner to obtain more definite information concerning the distribution of the electrons in the atoms. Arthur H. Compton.

Palmer Physical Laboratory, Princeton, N.J.,
April 29.

I have to thank the Editor for his kindness in allowing me to see Mr. Compton's letter. I believe Mr. Compton is right in ascribing the rapid decline in the intensities of the X-ray spectra as we proceed to higher orders to the fact that the atom should not be treated as a point, but as a distribution of electrons in space; if this is so, we may hope to determine this distribution when we have measured the relative intensities accurately and have learnt to interpret them. This hypothesis and its consequences were discussed by me in the Bakerian lecture given before the Royal Society in March last. As only short notices of the lecture have yet appeared in print, I may mention one or two of the points then raised.

It seems convenient to imagine a periodic distribution of density such as occurs in a crystal to be analysed by Fourier's series, in a manner suggested by previous work of Rayleigh, Schuster, or A. B. Porter (*Phil. Mag.*, January, 1906, p. 154). Each harmonic distribution of density is responsible for one order of reflection. The results of measurements with calcite seem to show that the intensity (not the amplitude) of the reflection by a "harmonic reflector" is proportional to the amplitude of the harmonic distribution of density; that is to say, that the intensity of the reflection is proportional to the mass of the reflector. It is necessary to explain, not only why the intensities of the various orders fall off approximately as the inverse square of the number of the order, but also why atom-bearing planes give intensities whose reflections are proportional to the squares of the distances separating the planes. It appears that both laws follow from the same hypothesis, viz. that which supposes the reflecting electrons to be distributed in space through the volume of the atom, and which imagines much overlapping to take place—atoms of one plane being thrust far into the interstices of the next.

Experiment seems to fit in with these ideas. Probably, however, it is necessary to take account also of a difference in the distribution in different atoms. For example, certain results seem to indicate that the sulphur atom is more concentrated than the zinc.

The University, Leeds. W. H. Bragg.

Early Figures of the Remora.

As remarked by Dr. Albert Günther, in his article on the history of the Remora ("On the History of the Echeneis," *Ann. Mag. Nat. Hist.*, 1860, ser. 3, vol v., p. 386), "there is scarcely a fish of the existence of which the ancients have been equally certain, and which has so much occupied their imagination . . . as the Echeneis of the Greeks or Remora of the Latins." Also, the same author continues, "there is scarcely a group of fishes . . . which has been so little *comparatively* treated, and which has experienced a similar splitting up into nominal species."

The ancient legends associated with this fish, from which it derives its name, signifying "ship-holder," persisted until well into modern times; and what is probably the earliest illustration of the Remora in printed books shows several of these creatures engaged in arresting the progress of a vessel. The curious woodcut referred to is found in that late fifteenth-century work known as "Hortus Sanitatis," the author or compiler of which styles himself Johannes von Cube, or Cuba, by some thought to have been a punning pseudonym for Dr. Wonnecken, town physician of Frankfort. First printed about 1490, the work enjoyed considerable popularity, as is proved by its having passed through several editions. A copy of the design representing the Remora, taken from the 1536 edition, is shown in Fig. 1.

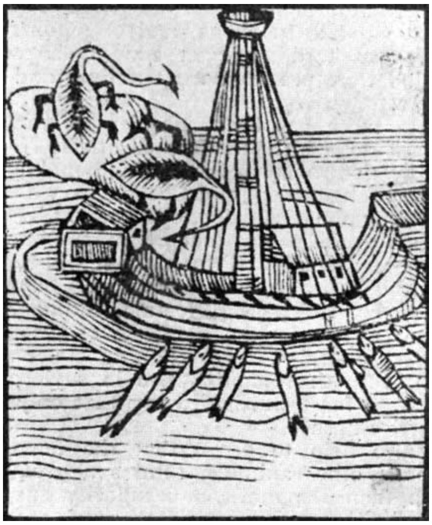

Fig. 1.—Earliest known printed figure of the Remora, from the "Hortus Sanitatis" of J. von Cube.

The next oldest illustration of the Remora appeared in a book, or perhaps a map, printed during the first half of the sixteenth century, and was copied by Conrad Gesner in book iv. of his "Historiæ Animalium," published in 1558. It is shown in Fig 2. The same figure, more or less modified, reappears in various seventeenth-century works on natural history, as, for example, those of Nieremberg, Aldrovandi, Jonston, Ruysch, and others.

Search for the original after which Gesner's figure was copied has proved unavailing; but the subject of the sketch, and also the verbal description, are traceable to the account of a West Indian species of sucking-fish, the first printed description of which is found in the "Libretto" of Peter Martyr of Anghera, published in 1504, and reprinted three years later in the collection of voyages known as "Paesi novamente Trovati."

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The source of Peter Martyr's information was undoubtedly Columbus himself, for we find the same fishing incident related, together with a more trustworthy description of a species of sucking-fish (probably *Echeneis naucrates*), in those fragments of the Journal of the second voyage of the great discoverer which have been preserved by his son Ferdinand, and by the chroniclers Bartolomé de Las Casas and Fray Andrés Bernádez.

Bernáldez, curate of Los Palocios, was a personal friend of Columbus, and had access to his Journals and other papers. Thirteen chapters of his history are devoted to the Admiral and his discoveries. In chapter 126 occurs an interesting passage relating to the Remora, which no doubt faithfully reproduces the famous navigator's own words. The only naturalist of modern times who has commented upon the incident in question, so far as the present writer has been able to find, is Alexander von Humboldt. Poey briefly refers to it in his description of the so-called *Echeneis guaican*, and Dr. Günther appears to doubt that the Remora was actually employed in the capacity narrated.

The passage in Bernáldez reads :—

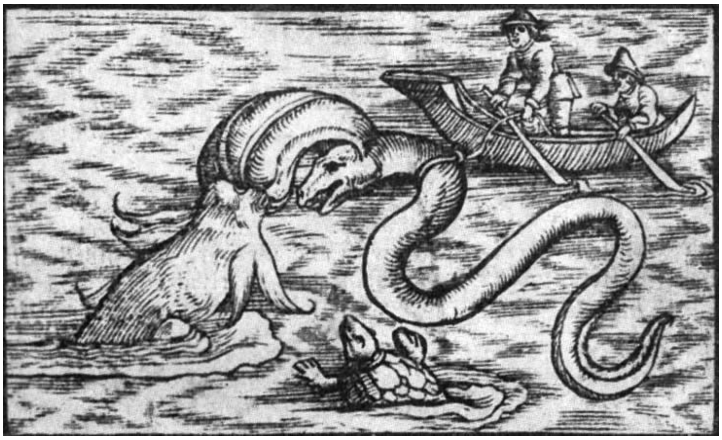

FIG. 2.—The Remora or "Reversus" as described by Christopher Columbus. (After Conrad Gesner, 1558.)

"[At the Queen's Gardens, off the coast of Cuba] on the day following [May, 1494] the Admiral being very desirous to find someone from whom he might obtain information, there came a canoe to hunt for fish :—for they call it hunting, and they hunt for one fish with another. They have fishes of a certain kind which they hold by a line fastened to their tails, and which are like the conger-eels in shape; and have a large mouth armed with suckers, like the cuttle-fish. They are very fierce, like our ferrets, and when they are thrown into the water, they go to fasten themselves upon some of the fishes there, and sooner die than let go their hold, till they are drawn out of the water. The fish is very light, and as soon as he has taken hold, the Indians draw him by the long cord tied to his tail, and immediately throw him into the water again; and in this way, they take one every time. As these hunters were at a distance from the caravel, the Admiral sent his armed boats to them, contriving it so that they should not escape to land. As the boats came up to them, these hunters called out to the men, as unconcernedly as if they had known them all their lives, to stop, because one of the fishes had fastened upon a large turtle, and they must wait till they had got it into the canoe.

"This our men did, and afterwards they took the canoe, and those in it, together with four turtles, each of which was three *codos* long, to the ships of the Admiral; and there they gave some account of these islands, and of their cacique, who was close at hand, and had sent them to hunt. They asked the Admiral to go on shore, and they would make for them a great feast, and would give to them all four of the turtles."

C. R. EASTMAN.

American Museum of Natural History, New York.

A Mathematical Paradox.

"Two horses, side by side and four feet apart, run once round a race track. How much further does the outer horse go than the inner?"

If this question is asked, in nearly every case the immediate reply is that it depends on the size of the track. It is somewhat paradoxical that the distance is 8π, or a little more than 25 ft., is actually independent both of the size and of the shape of the race track, provided that there is no reversal of curvature.

This problem is stated in a more formal manner in Williamson's "Integral Calculus," namely, if two curves have the same evolute the difference of their lengths is $4\pi D$, where D is the distance between the curves.

A. S. E.

A Mistaken Wasp.

THE mistake made by the cabbage butterfly referred to in NATURE of May 20, appears to be made by other insects.

Quite recently (last week in April) whilst having lunch in a sunny room decorated with a light-coloured paper with a floral design of pink roses in full bloom, a large wasp entered and became very agitated; observing it for some little time, I noticed it alight every moment or so in the centre of one of the roses, remain a moment, then off again to another; it appeared to be getting very angry as it went from rose to rose, which it kept on doing during the time I was in the room—twenty minutes or so.

W. A. GUNN.

Corporation Museum and Art Gallery,
Dock Street, Newport, Mon., May 22.

THE PENGUINERY RE-VISITED.[1]

THE author's fascinating popular account of the social life of the Adélie Penguin (*Pygoscelis adeliae*) has been already reviewed in these columns, but the subject is of such great interest and Dr. Levick is such a consummate observer that we make no apology for turning to this second and more formal publication in the hope of adding to the completeness of the picture previously presented.

Apart from the observations made by the late Dr. Edward A. Wilson, which may be accepted, we are told, as "entirely correct," previous descriptions of the life of the Adélie Penguins have failed to do justice to these wonderful birds. About the middle of October they appear in ones and twos on the beach at Cape Adare, and by the end of the month there may be three-quarters

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[1] British Museum (Natural History). British Antarctic (*Terra Nova* Expedition, 1910. Natural History Report. Zoology. Vol. i., No. 2. "Natural History of the Adélie Penguin." By Staff-Surgeon G. Murray Levick. Pp. 55–84+plates i–xxi. (London: British Museum (Natural History), and Longmans, Green, and Co., 1915.) Price 5*s*.

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